



TITLE:

Studies on the Cuprammonium Hydroxyde Solution of Cellulose. (I) : On the Degradation of Cellulose in the Solution

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Table 3. Experimental conditions.

Exp. No.	Original pig iron	Slag No.	Pig iron Slag	Decomp. Temp. °C	Melt. Time (min.)	Cooling condition
D-2-1	Cupola	S-3'	5/1	1400	60	(a)
D-2-2	◇	◇	◇	◇	◇	(b)
D-2-3	◇	◇	◇	◇	◇	(c)
D-2-4	◇	◇	◇	◇	◇	(d)
D-3-1	◇	S-4	◇	◇	◇	(c)
D-3-2	◇	◇	◇	◇	◇	(c)

Table 4 shows the results obtained (by these experiments). Combined Nitrogen contained in Cast Iron was decreased irrespective of Nitrogen in HCl soluble solution and HCl insoluble residue. And we find that the cooling conditions affect the denitrogenation. The influence of cooling condition had also been acknowledged from the results of the experiment with no slag in Report III.

Table 4

Exp. No.	N % in HCl soluble solution	N % in HCl insoluble residue	Total N %
Original Sample	0.0033	0.0081	0.0114
D-2-1	0.0008	0.0044	0.0052
D-2-2	0.0005	0.0027	0.0032
D-2-3	0.0026	0.0078	0.0104
D-2-4	0.0007	0.0076	0.0083
D-3-1	0.0028	0.0090	0.0120
D-3-2	0.0023	0.0089	0.0112

On the other hand, state of solidifying atmosphere should be regarded as to affect the cooling condition.

For the phenomena above mentioned, the investigations carried out by us are not sufficient to give a definite conclusion.

Flaky graphite carbons were found to become finer in our experiments.

60. Studies on the Cuprammonium Hydroxide Solution of Cellulose. (I)

On the Degradation of Cellulose in the Solution

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(Horio Laboratory)

With a view of elucidating the phenomenon of the degradation of cellulose in

the cuprammonium hydroxide solution in such a concentrated solution as is actually used in the rayon industry, the authors tried to study the degradation in terms of the decrease of the solution viscosity and of the degree of the polymerization separately determined.

The viscosity of the solution of purified linter decreased in parallel with the D. P. of degraded cellulose. From the obtained values of the D. P., the values of α , the degree of decomposition, were calculated according to the following formula of E. Montroll,

$$Pw(\alpha) = \frac{2-\alpha}{\alpha} - \frac{2(1-\alpha)}{\mu_1 \alpha^2} \left\{ 1 - \exp. \left(-\mu_1 \alpha + \frac{\alpha^2 \sigma^2}{2} \right) \right\}$$

assuming that the distribution of D. P. was normal. And from the α vs. time relation, we found that the rate of degradation could be given by

$$\frac{d\alpha}{dt} = (1-\alpha)(\alpha_0-\alpha) \frac{1}{\sqrt{t}}$$

where, λ , α_0 : constants, being a heterogeneous reaction of second order.

As to a more detailed information concerning the mechanism of the reaction, it is still under investigation. However, it is so far certain that the cause of the degradation reaction must be the oxygen creeping into the system.

61. The Correlation among the Viscosity of Solution, the Concentration and D. P. of Cellulose. (II)

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The viscosity of the solution is of primary importance in practical spinning of the rayon. The viscosity of the solution was accordingly studied in respect to the concentration of solution and the D. P. of this material.

The following relation was found to exist among η rel, C and P ,

$$\log \frac{\eta \text{ rel}}{C} = \alpha \log P + \beta C + \gamma$$

where, η rel: relative viscosity of the solution, C : concentration of cellulose, P : degree of polymerisation.

In this formula α and β being constants, about 5 and 0.3 respectively, the viscosity of the solution is by far the more enhanced as P or C increases.

The decreases of η and P as obtained in the paper I was checked by this formula and the validity of the formula was ascertained.

It is presumable that this conspicuous influence of the concentration and the D. P. of cellulose upon the viscosity of the solution must be due to the formation of some structure resulting from a strong mutual reaction between cellulose molecules in such a concentrated solution.